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ABSTRACT

G. Wolford's perturbation model of letter identification is designed to account for identification errors of briefly presented characters. Its chief assumptions are that features are extracted in parallel, that some of these features become perturbed or mislocalized, and that mislocalizations are more likely to occur in the direction of the fovea for parafoveally presented characters. C. L. Krumhansl and E. A. C. Thomas used this model to account for their findings that placing a nontarget character to the peripheral side of a parafoveally presented target character disrupted target identification more than did placing one to the target's foveal side. Features from a peripheral nontarget were assumed to be mislocalized to mix with those of the target, making target identification difficult. To test the feature mixing explanation, 20 subjects participated in an experiment that involved identifying a gap in a Landolt C in a left and then right order and then reporting whether a nontarget character (either a circle or a capital H rotated 90 degrees) had appeared between two targets in a series. The experience produced no evidence that the nontarget that was similar was foveally mislocalized to become confused with the inner target. The nontarget's adverse influence, which was greater when the nontarget was less similar to the targets, affected both the inner and outer targets. (FL)

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CS 007219

Identifiability of Peripheral Trigram Characters and their Confusability with the Embedded Character

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Wolford (1975) proposed a model to account for identification errors on displays of briefly presented characters. Its chief assumptions are that features are extracted in parallel, that some of these features become perturbed or mislocalized, and that mislocalizations are more likely to occur in the direction of the fovea for parafoveally presented characters. Krumhansl and Thomas (1977) used Wolford's perturbation model to account for their finding that placing a nontarget character to the peripheral side of a parafoveally presented target character disrupts target identification more than placing one to the target's foveal side. Features from a peripheral nontarget were assumed to be mislocalized to mix with those of the target, making target identification difficult. Features from a nontarget to the foveal side would be mislocalized in a direction away from the target, making its identification easier. Although the target's features also tend to be mislocalized foveally, identification is often possible from those features correctly localized as long as they are not mixed with those of the target.

We decided to test the feature mixing explanation by presenting two separated Landolt C's parafoveally. Each contained a gap at the top or bottom. Between the C's on half the presentations was a third character. As you can see in Figure 1, the 10 subjects in one group received a

circle which was actually a Landolt C without a gap as the third character. The 10 subjects in the other group received a capital H which was rotated 90 deg. The task involved identifying the position of the gap in the C's in a left then right order, and then reporting whether the nontarget character had appeared between the two targets on that exposure. The characters were presented in the left visual field on half the trials, and in the right visual field on the other half. Overall accuracy on gap position reports was stabilized at 70 to 75% through exposure duration manipulations between the blocks of trials. Gap positions and nontarget presence were varied factorially within each of the 10 blocks of 16 test trials. Mean exposure duration did not differ for the groups ($t(18) = .47$).

We predicted that detection of the rotated H nontarget would be easier than detection of the round nontarget. This might be due to feature mixing, since angular features of the rotated H would be more obviously present than curves from the nontarget circle even if mixed with the curves of the Landolt C's. However, other researchers have attributed the poorer performance they observed on similar shapes than on dissimilar ones to factors other than feature mixing, such as differential inhibition of feature extraction (Santee & Egeth, 1982; White, 1981).

If feature mislocalizations toward the fovea were the basis of the differential accuracy with which the two nontargets were detected, we would expect that (1) identification accuracy would be lower on trials upon which a nontarget is present, and the inner target would be affected more than the outer target, and (2) accuracy on the inner target would be affected to a different degree by the two nontargets, while accuracy on the outer target would not.

Analysis of the nontarget detection data, corrected for response bias (Gummerman, 1972), indicated that the rotated H was detected with significantly greater accuracy than the circle ($t(18) = 2.57$, $p < .02$). The proportions of trials yeilding correct detection responses were .946 and .817 for the H and circle, respectively.

Analysis of variance showed that identification accuracy was significantly lower on those trials upon which a nontarget was present ($F(1,18) = 22.00$, $p < .001$), as is apparent from the Grand Means in Table 1. The significant groups by nontarget present/absent interaction ($F(1,18) = 8.04$, $p < .02$) indicated that the rotated H nontarget was more disruptive than the circle nontarget. However, as the means in Table 1 suggest, there was no hint of a significant interaction between target location and nontarget present/absent ($F < 1.0$), nor of those two variables with groups ($F < 1.0$).

Conditional analyses were conducted to determine more directly whether the inner target was more likely to be misidentified when the nontarget was missed, and if so, whether this occurred to a different degree with the two nontargets. In the analysis of identification accuracy given misses only, as well as the analysis given misses or false alarms, neither the effect of target position nor the interaction between groups and target position approached significance (all ps $> .30$).

The experiment produced no evidence that the nontarget was foveally mislocalized to become confused with the inner target. The nontarget's adverse influence, which was greater from the nontarget that was less similar to the targets, affected both the inner and outer targets. The model in question would predict that any adverse influence of the presence of the embedded nontarget would fall on the inner, but not the outer, target.

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Figure 1. Stimuli used in the experiment with visual angles indicated.

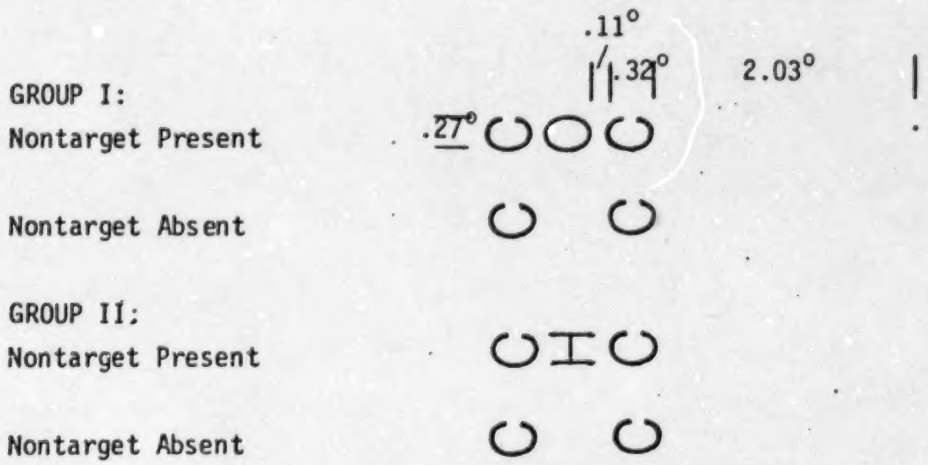

Table 1

Proportion of Targets Correctly Identified with Nontargets Present and Absent

Group	Target Location	Nontarget	
		Present	Absent
I	Inner	.738	.753
	Outer	.705	.735
	Mean	.722	.744
II	Inner	.685	.791
	Outer	.726	.803
	Mean	.706	.797
	Grand Mean	.714	.771